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NOAA/ESRL/GSD



AMS 2016

#### Outline

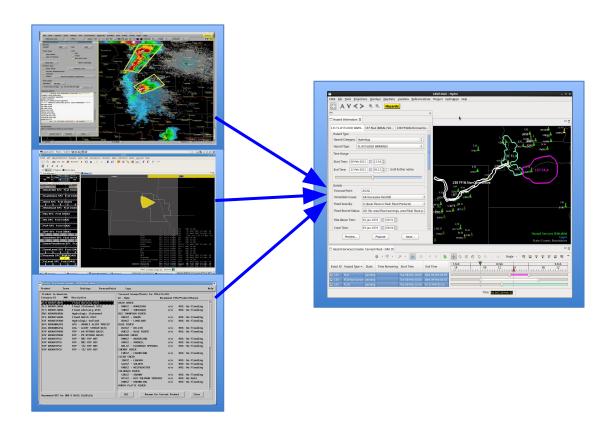
- Operational Hazard Services
- Flexibility Supports Extension to other Services
- Example Experimental Projects
  - Conduit for Leading Edge Science
  - Diversity of Hazard Characteristics
  - Multiple Products Disseminated

## Operational Hazard Services: Unifying Legacy Applications

WarnGen (<1 hour)

Graphical Hazard Generator (Hours, Days)

RiverPro (Days)

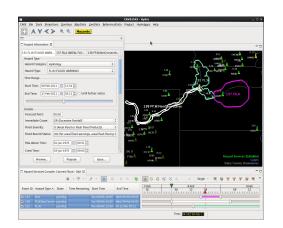


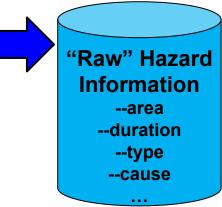
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### Multiple Communication Pathways













Published on: 06/14/2014 at 6:20AM

#### Text Products

0545 AE. FF. W. 0017. 150926T0396Z-150926T0545Z/

BULLETIN - EAS ACTIVATION PEQUESTED FLASH FLOOD MARKING NATIONAL MEATHER SERVICE COLUMBIA SC 1136 PM EDT FRE SEP 25 2015

THE NATIONAL WEATHER SERVICE IN COLUMBIA HAS ISSUED A
\* PLASH PLOOD MARKING FOR...

\* INTIL 145 AM EDT

\* AT 1151 PM EDT...DOPPLER PADAR INDICATED YERY MEANY PAIN A

\* SOME LOCATIONS THAT WILL EMPERIENCE PLOCOTION INNLICE...
EXITORIN.

CONSERVATIONS AND PROMISESTIMATES OF 2-4 IND-ES OF PAIN OWEN THE F
HOLD WILL LINEAU LEGO TO FLOCKING OF SMALL CREEKS AND STREAMS ALL

CHECK MALEY. ACCOUNTS ON THE PAIN OF 19 70 PAIN SET EMPORTED.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

MOVE TO RECHER CROUND NOW. ACT QUICKLY TO PROTECT YOUR LIFE.

REPORT LARGE HALL...CHMAGING WINDS OR PLOCKING TO YOUR COUNTY
SHERIFF... ALSO USE WAN.FACEBOOK.CHV/MSCOLURIDA AND EMAIL.

CAMANINADA. OUT OF DELAY SEVERE WANTHER REPORTS.

AT...LON 3400 8065 3397 8063 3397 8062 3391 80 3385 8063 3383 8062 3383 8076 3415 8050 3412 8078 3407 8072 3409 8065 3408 8062

#### **XML** Formats

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#### **Forecast Process**

# Conduit for transforming leading edge science into actionable information for decision-makers



A better-informed Weather-Ready Nation that is resilient in the face of high impact weather and environmental events

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## Unifying Legacy Applications -- Customization and Extensibility

All three legacy applications independently developed frameworks for customization.

#### WarnGen

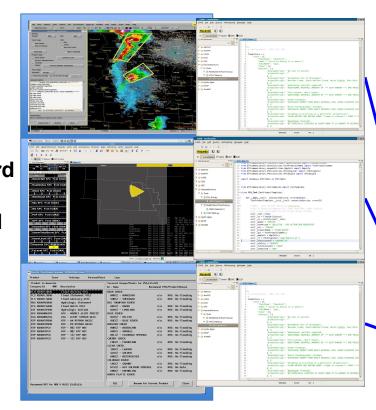
(Algorithms and Templates)

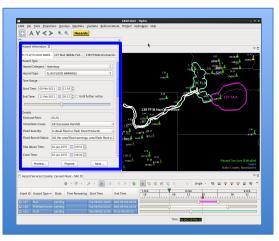
## Graphical Hazard Generator

(Smart Tools and Python Scripts)

#### **RiverPro**

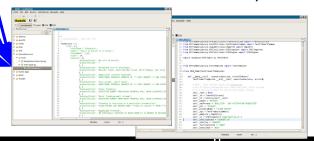
(Recommenders and Templates)





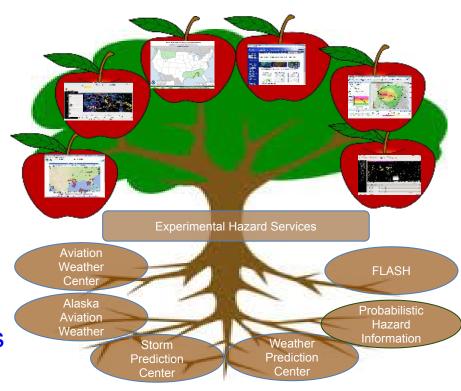
#### **Hazard Services**

(Recommenders, Metadata in Hazard Information Dialog, Product Generators and Formatters)



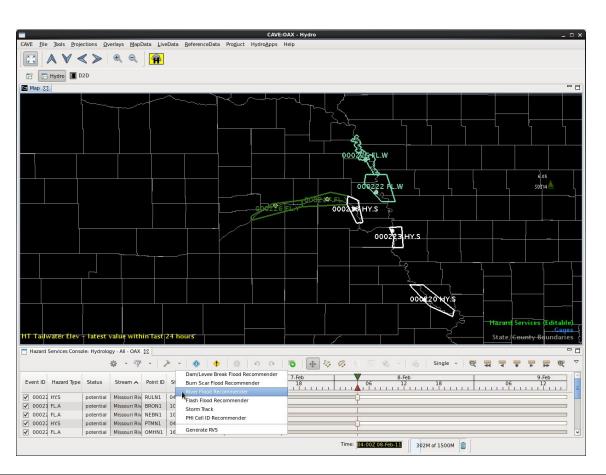
#### **Consistent Continuous Forecasts**

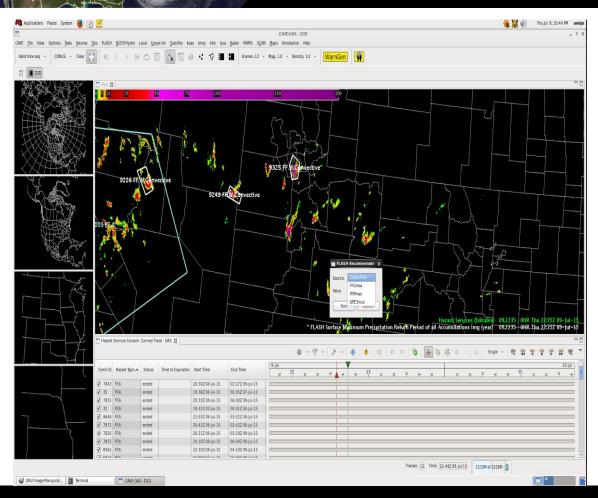
- Can be extended to different domains and problem spaces
- Shared platform across local and national scales for collaboration and consistency
- Leading the way to Forecasting a Continuum of Environmental Threats (FACETs)
- Conduit for Science
- Diversity of Hazard Characteristics
- Multiple products



Gage Data for River Floods

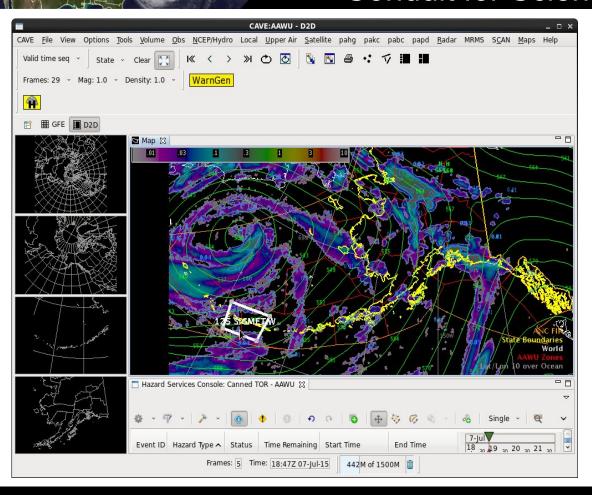
Hazard Services for Forecast Offices





Multi-Radar / Multi-Sensor (MRMS) Data for Flash Floods

FLASH – Flooded Locations and Simulated Hydrographs Project

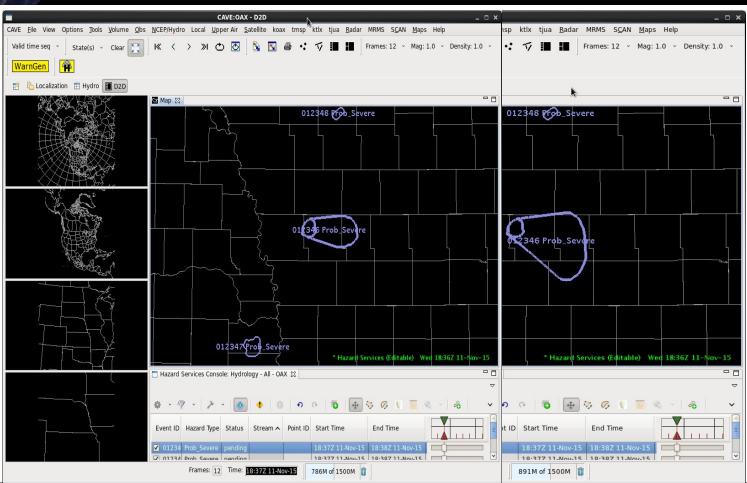


Turbulence and Icing for SIGMETs (Significant Meteorological Information)

**Aviation Weather Centers** 

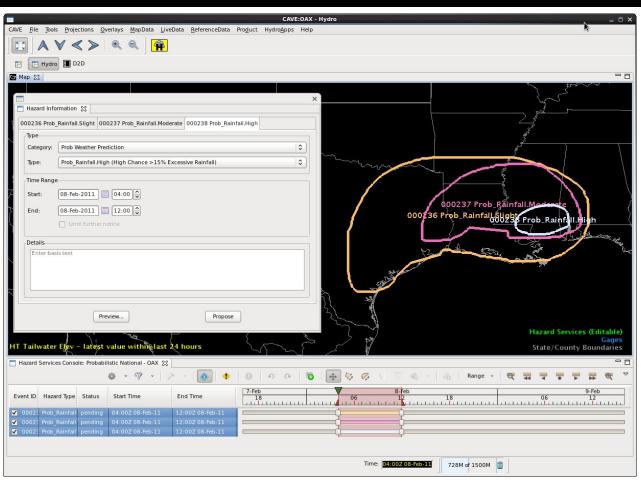
Multi-Radar / Multi-Sens0r (MRMS) ProbSevere Data for Convective Events

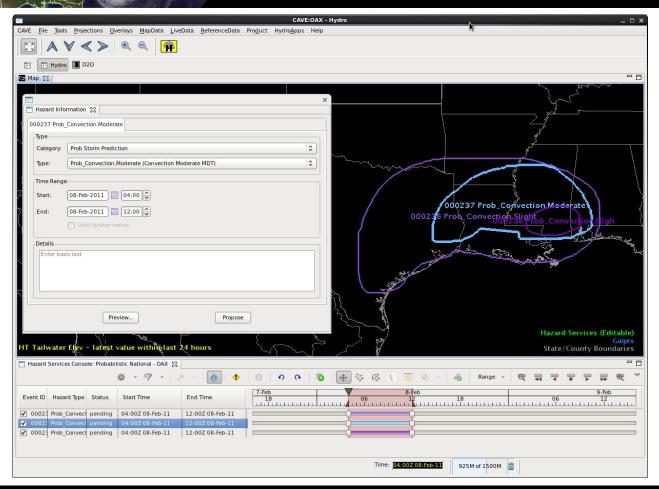
Probabilistic Hazard Information



Storm Scale Ensemble of Opportunity (SSEO) coupled with Flooded Locations and Simulated Hydrographs (FLASH) for **Excessive Rainfall** 

Weather Prediction Center

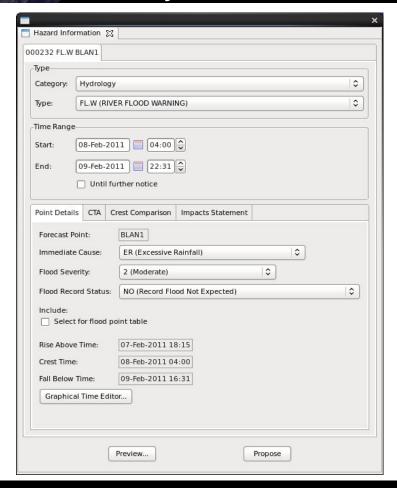


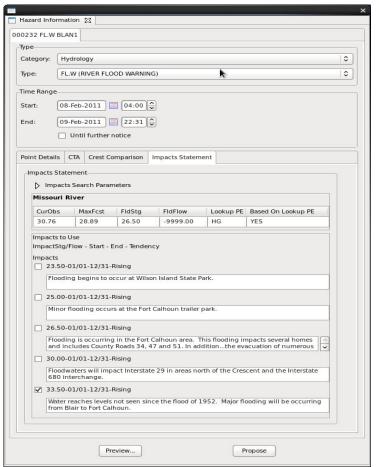


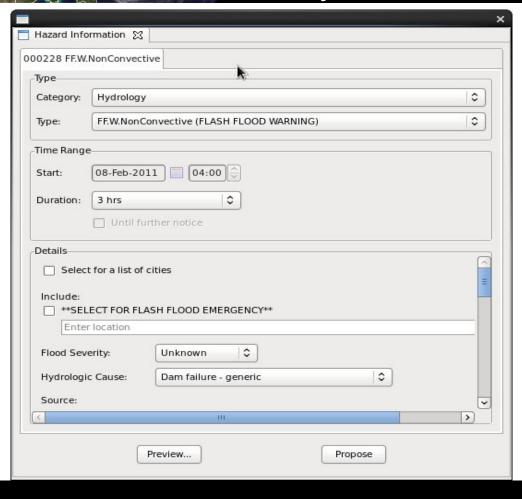
Refined Calibrated Guidance for Severe Convection -- combining Short Range Ensemble Forecast (SREF) with Storm Scale Ensemble of Opportunity (SSEO)

Storm Prediction Center

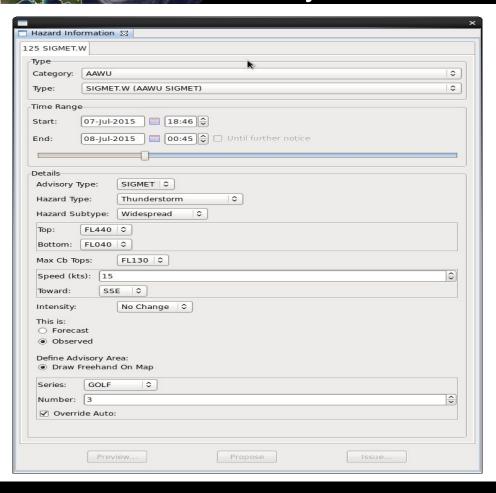
# River Flooding





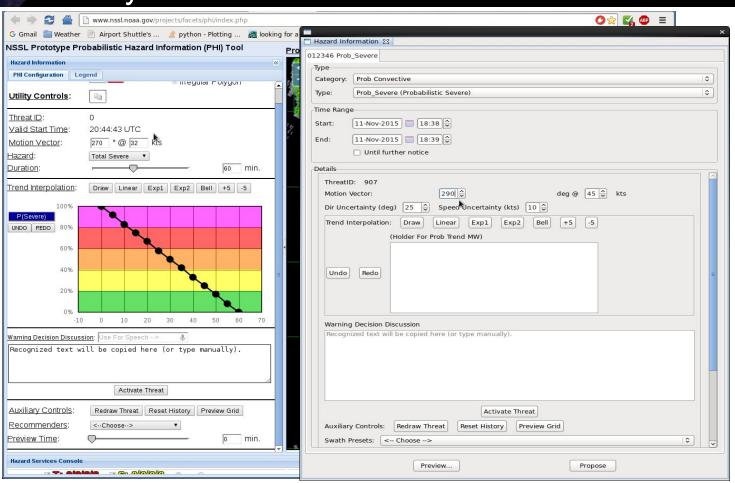


# Convective Flash Flooding

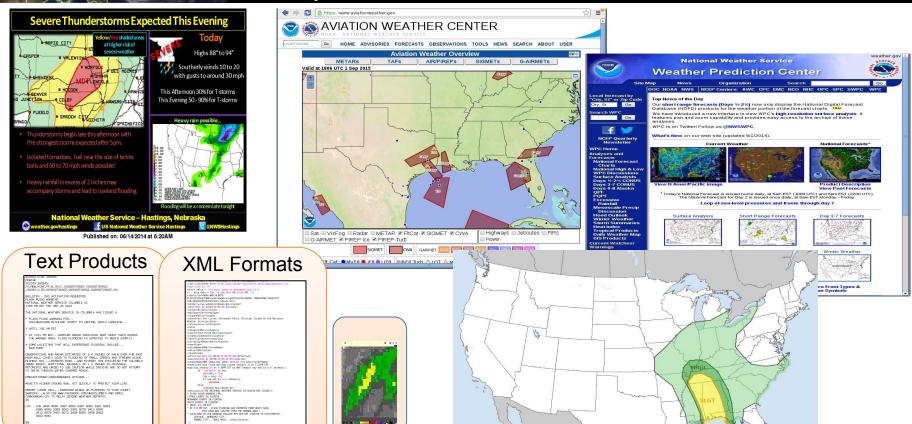


SIGMET (Significant Meteorological Information) for Aviation Icing and Turbulence

Probabilistic
Hazard
Information
for Severe
Convective



### Multiple Products Disseminated



SPC DAY 1 CATEGORICAL OUTLOOK ISSUED: 1247Z 12/28/2015 VALID: 28/1300Z-29/1200Z

FORECASTER: HART/COHEN

Categorical Outlook Legend:

TSTM 1: MRGL

#### Summary

- Operational Hazard Services for legacy WFOs continues
- Expanding the concepts to other domains and programs
- Integrating improved capabilities in the process
  - New science for first guess hazard
  - Diversity of hazard characteristics
  - Multiple products disseminated





## Extra Slides

## Framework Approach for Customization and Extensibility

Hazard Services Solution: Build Frameworks that allow user to modify and extend the baseline capabilities using Python code to match full power of legacy applications



"Give a man a fish, he eats for a day; teach him to fish, he eats for a lifetime."

 Most efficient solution -- faster to build a framework than to handle all of the scenarios deterministically